

**CE CIT UOB**  
**ITCE471 (DSP)**  
**Quiz 3**

**Time: 15 minutes**

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**Q:** Find the Z-transform and ROC of the following system and discuss its stability:

$$h[n] = (1/2)^n u[-n]$$

$$\begin{aligned}
 &= \sum_{n=-\infty}^{\infty} \left(\frac{1}{2}\right)^n u[-n] z^{-n} \\
 &= \sum_{n=-\infty}^0 \left(\frac{1}{2}\right)^n z^{-n} \\
 &\text{let } m = -n \\
 H(z) &= \sum_{-\infty}^0 \left(\frac{1}{2}\right)^{-m} z^m \\
 &= \sum_{-\infty}^0 \left(\left(\frac{1}{2}\right)^{-1} \cdot z\right)^m \\
 H(z) &= \sum_{-\infty}^0 (2z)^m \\
 &= \frac{1}{1 - 2z}, \quad |2z| < 1 \quad \checkmark \\
 H(z) &= \frac{z}{z - 2} \\
 H(z) &= \frac{z}{z - (0.5)} \\
 &|2z| < 1 \\
 &z < \frac{1}{2} \\
 \text{ROC} & \text{ (circle centered at } 0.5 \text{ with radius } 0.5) \quad \checkmark \\
 &\text{un-stable system} \quad \checkmark
 \end{aligned}$$

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